19. An apparatus as in claim 17, wherein the flow redirecting device comprises a plurality of spheres fused together at their contact surfaces.

20. An apparatus as in claim 13, further comprising an exothermic reaction stream in each of said first reaction channels and an endothermic reaction stream in each of said second reaction channels.

21. An apparatus as in claim 20, further comprising an inlet and an outlet for said exothermic reaction stream, configured such that the flow of said exothermic reaction stream through said inlet and said outlet is transverse to the flow of the exothermic reaction stream through each of the first reaction channels.

22. An apparatus as in claim 20, further comprising an inlet and an outlet for said endothermic reaction stream, configured such that the flow of said endothermic reaction stream through said inlet and said outlet is transverse to the flow of the endothermic reaction stream through each of the second reaction channels.

23. An apparatus as in claim 13, wherein said exothermic reaction is combustion and said endothermic reaction is steam reforming, wherein said steam reforming reaction produces hydrogen gas, wherein said hydrogen gas is fed into the anode of a fuel cell.

24. An apparatus as in claim 13, further comprising an endothermic reaction stream in at least one of said first reaction channels, an exothermic reaction stream in at least one of said second reaction channels, and a heater to heat at least one reaction stream entering a reaction channel.

25. A method for performing an endothermic and an exothermic reaction simultaneously, said method comprising:

passing an endothermic reaction stream and an exothermic reaction stream through a plurality of adjacent, alternating first and second reaction channels defined by spaced apart, thin metal, heat conductive separators, wherein each separator comprises first and second surfaces, wherein at least a portion of said first surface is coated with an exothermic reaction catalyst and at least a portion of said second surface is coated with an endothermic reaction catalyst,

wherein said first reaction channels comprise the first surfaces of two adjacent separators and said second reaction channels comprise the second surfaces of two adjacent separators;

catalyzing an exothermic reaction in said first reaction channels to generate heat, wherein said heat is transferred across the separators into said second reaction channels;

and catalyzing an endothermic reaction in said second reaction channels, wherein the endothermic reaction in the second reaction channels consumes the heat generated by the exothermic reaction in the first reaction channels.

26. A method as in claim 25, wherein said exothermic reaction is combustion and said endothermic reaction is steam reforming.

27. A method as in claim 25, further comprising heating at least one reaction stream with a heater.

28. A continuous-flow catalytic plate reactor for performing an endothermic reaction and an exothermic reaction in adjacent isolated reaction chambers to supply the heat required by said endothermic reaction by said exothermic reaction, comprising:

a) a stack of catalyst-coated platelets interleaved with transverse-flow plates, each of said catalyst-coated platelets and said transverse-flow plates comprising four apertures arranged in a spaced, substantially rectangular array and disposed as a first pair of apertures adjacent one end and a second pair of apertures adjacent a spaced, opposed end, all four apertures of one plate being aligned with all four apertures of all other plates of said stack;

b) each of said catalyst-coated platelets being impermeable to gas flow through said platelets and each having a coating of catalyst for said exothermic reaction on one side and a coating of catalyst for said endothermic reaction on the other side;

c) each of said transverse-flow plates includes a void region medial in said plate joining only one of said pairs of apertures to expose said catalyst coatings on both adjacent catalyst-coated platelets, which platelets form the side walls of said flow plate void region to define a reaction zone therebetween, said transverse-flow plates alternating between those in which said void region joins said first pair of apertures and those in which said void region joins said second pair of apertures;

d) said apertures and reaction zones defining two non-commingling flow paths through said stack;

e) the first of such flow paths extending from one of the aligned apertures of said first pair through the reaction zone of every second traverse-flow plate while passing over said coating of catalyst for said exothermic reaction to the remaining one of the first pair of aligned apertures; and

f) the second of such flow paths extending from one of the aligned apertures of said second pair through all remaining reaction zones while passing over said coating of catalyst for said endothermic reaction to the remaining one of the second pair of aligned apertures.